AMATEUR SATELLITE REPORT

AMSAT's Newsletter for the Amateur Space Program.

Amateur Satellite Report is endorsed by the American Radio Relay League as the special interest Newsletter serving the Amateur Radio Satellite Community

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ASR *Name Changes*

Beginning with this edition of *ASR, ASR* has a new meaning. Now we are *Amateur Satellite Report*. The change in name reflects our growing scope and interests. Our name change does not effect the editorial control or content of the newsletter. Neither does it affect who writes the reports or AMSAT's role as the publisher. It does however provide a means to broaden our vistas by accepting the endorsement of the ARRL. Our friends in Newington recognized a need to service the general amateur radio community with a satellite newsletter much as it is doing for other so-called special interest groups. However, ARRL wisely avoided reinventing the wheel since *ASR* was already in place with an established reputation for excellence and a growing readership. *ASR* was (is) de facto newsletter of the amateur satellite community. The ARRL endorsement is proudly displayed on our masthead as both a symbol of continued friendship and solidarity with ARRL. And, as good friends do, ARRL and AMSAT will occasionally view things differently; will occasionally get feathers ruffled. Nevertheless, the ARRL leadership has consistently backed the amateur space ideals and AMSAT since AMSAT's founding. It is thus fitting that AMSAT's voice, *ASR*, should bear the famous ARRL diamond together with its own logo.

ASR thus joins other excellent newsletters ARRL has endorsed or is sponsoring such as W4RI's QEX. In summary, AMSAT accepts ARRL endorsement but will remain in control of all aspects of *ASR*. Of course ARRL staff, e.g. W9KDR, will be invited to submit editorial materials subject to AMSAT standards of relevancy and content.

So welcome to the new *ASR...Amateur Satellite Report*. And watch for our advertisements for new subscribers. If we can build our readership as we hope to, we can help keep our present low rates longer. So tell your friends and pass the world. *ASR* is bigger and better than ever.

Short Bursts

• A revised proposal to allow Dr. Owen Garriot, W5LFL, to carry an hand-held amateur transceiver on STS-9 next October is being evaluated by NASA HQ in Washington, D.C. AMSAT's W4PUJ, W3XO and ARRL's W9KDR are working the case while promoters K6DUE, W5LFL, WØORE, W4KFC, K1ZZ, et al, stoke the burners.

• AMSAT's Phase IIIC proposal has received very favorable initial reviews by Air Force officials who have seen it. There's much review and negotiation remaining, however. If all lights turn green, Phase IIIC will ride a USAF launch circa 1984.

• Surrey scientist Dr. Martin Sweeting, G3YJO, (UO-9 Program Manager) will soon meet with Space Services Inc.'s Deke Slayton to map out how Surrey will approach building a payload for a future SSI launch. SSI recently launched Conestoga 1. (See *ASR* #41.) Various individuals directly or indirectly affiliated with AMSAT and its member organizations will be working on the project. The result may be a new launch opportunity of the OSCAR 8 class (low polar sun synchronous) to carry the newly announced PACSAT packet radio, store and for-

New Iskra

Iskra 3 was deployed from the Russian Salyut 7 spacecraft on Thursday, 18 November 1982, according to TASS, the Soviet News Agency. The birth of Iskra 3 was very similar to Iskra 2 which occurred on 17 May 1982 (see *ASR* #34).

At presstime, several stations had observed the complex telemetry transmissions on 29.583 MHz. The following orbital data is supplied by K1HTV and W4PUJ.

Designation: Iskra 3; object #82-033AD; cat. #13663
Ref. Epoch: 82 322.76294085
RAAN: 125.6904
Eccentricity: 0.0002195
Inclination: 51.6338
Mean Motion: 15.72403550
Mean Anomaly: 200.3331
Arg. of Perigee: 159.7567
1st Der. Mean Motion: 0.00388810
Rev. # of Ref. Epoch: 3372
Period: 91.615461
Incre.: 23.275886

Salyut 7

ward system. KD2S recently was named Project Manager for PACSAT.

• *Orbit* Magazine will soon have a few new names on the masthead. Dom Malozzi, N1DM, will become Assistant Editor and Bob Ruedisueli, W4OWA, will appear as Associate Editor of AMSAT's publication.

• Phase IIIB launch is now scheduled for the second half of April 1983. The program stretchout has caused AMSAT's funding to be drawn down to near crisis proportions. It is essential that renewals be posted promptly to avoid further fiscal stress. This according to President W3IWI. Major economy measures are under evaluation and will be discussed at the Autumn Board Meeting (see below).

• The Autumn meeting of the AMSAT Board of Directors has been scheduled for the weekend of 3-5 December in the Washington, D.C. area. Write or call any Director for information. All Directors are planning to attend (W3IWI, W3GEY, K1HTV, W6SP, JA1ANG, G3IOR, VE2VQ).

• Transmissions of the Westlink Amateur News Service on AMSAT-OSCAR 8, Mode J have been reasonably successful to date. The service has been provided from WA2LQQ on the last orbit of AO-8 every Saturday, UTC. Although fading on the downlink adversely affects the readability occasionally when AO-8 approaches the Auroral oval, reception has been, for the most part, excellent. It's good enough for WØRPK to relay over a Central Iowa repeater. Much interest is being generated in the general Amateur Radio community this way. The whole exercise is designed to set the stage for when bulletins become a regular feature of Phase IIIB next summer!

• John DuBois, W1HDX, says his Mode L station is complete and ready to talk to someone. Unfortunately there's no Phase IIIB bird up there at which to beam that 100 watts from the little dish. W1HDX is the Chief of the Phase IIIB ground command team and has just about completed all preparations at his station.

• John McDonald, WB4ZXS, of Cocoa, Florida, has interfaced a commercially available modem to his ZX-81 and with it is able to access the AMSAT Software Exchange (ASE) Computer Bulletin Board Service (CBBS). The CBBS is located in Corpus Christi, Texas. (Telephone 512-852-8194; see *ASR* #31). WB4ZXS is anxious to spread the word of his find and will do just that if you send him an SASE at his Callbook address.

• The Project OSCAR Orbital Prediction Calendars for 1983 are now available for ordering. The new calendar will cover AO-8, RS-5, RS-6, RS-7 and RS-8 for the entire year of 1983. Price is $10 shipped postpaid in the U.S. and $12 overseas. Write: Project OSCAR, P.O. Box 1136, Los Altos, CA 94022. Orders shipped FIFO (first in, first out), so get your order in EARLY!

• Following launch of STS-5 rumors were rampant on the ham bands that someone on the Shuttle was operating on the amateur bands. Lots of confusion, half-truth and plain silliness characterized the affair. Actually JPL was netting the audio from NASA for amateur use only on terrestrial repeaters by virtue of a 90 day FCC Special Temporary Authorization. Interest in hamming vis a vis space is growing very quickly. Tell your friend about AMSAT.. and get him to join.

• The ZX-81 project is making excellent progress under the leadership of KO5I. WØRPK is the hardware driver while W3IWI loops the software.

• AMSAT's new command station at the AMSAT-OSCAR Spacecraft Laboratory at the Goddard Space Flight Center is taking shape according to W3GEY.

• An Area Coordinator is sought for Australia. Contact WH6AMX.

• No further news on the Cablesat General (ARNET) proposal; QRX

• AMSAT trinket closet holds lots of goodies; more to come. Now available: callsign badges, decals, RS overlays, ARRL OSCARlocator packages. Soon, new tie tacks, desk sets, more. Call or write AMSAT HQ.

• An excellent mini-magazine from Germany is *Satelliten Info Service* by Heinz-Juergen Wehle, DB5ER, Postf. 170313, 4000 Duesseldorf, 1 Federal Republic of Germany. Write Heinz for info on *SIS*. Naturally this is a German language publication.

• Deployment of two large communications satellites from the cargo bay of the Columbia on STS-5 was a TV-public relations coup by NASA. The graphic appeal of watching these 7000 pound birds spinning up and out of the cargo bay was likely worth millions to NASA in terms of favorable publicity. The Telesat Canada and Satellite Business Systems satellites were doing well when last heard from. NASA got $8 million each for the trip to low earth orbit from each of the communications concerns. Kick motors then lofted each to a more useful (geosynchronous) orbit.

• The three major U.S. TV networks are furiously vying for the opportunity to place a top TV correspondent aboard a Shuttle flight in 1985 or 1986 according to reliable sources. Each network wants its top science reporter to be able to report "live" from space on what Halley's comet looks like from earth orbit. By the time Halley's comet is within easy view of earth, NASA will be shuttling certain closely screened individuals to space. CBS, NBC and ABC want Cronkite, Neal (K6DUE) and Bergman respectively to be the first journalist in space. A long-shot candidate was thought to be *ASR*'s Editor. Hi!

UoSAT Carries Codestore

The codestore of UoSAT-OSCAR 9 will be loaded with test messages which will be transmitted on weekends at 300 ASCII and 45.5 baud Baudot. The codestore can be monitored on 145.825, NBFM. Reports of reception may be sent to AMSAT UK Secretary G3AAJ at 94 Herongate Road, Wanstead Park, London, England, E12 5EQ. Surrey is interested to know quality of reception according to G3AAJ as relayed by W8GQW.

Meanwhile, G3AAJ reports that the satellite spin-down regime is proceeding apace. The objective is to reduce spin to less than 1 revolution per minute. This likely will have been accomplished as you read this. Deployment of the boom and activation of the hf beacon experiment may then follow. Deployment of the gravity gradient boom also depends on rectification of the z-axis from its present orientation to an attitude perpendicular to the

plane of the orbit. At last report the nutation angle was 15.2 degrees; a manageable value.

UoSAT's telemetry seems notably easier to copy as the fade rate seems to have decreased since last monitored at WA2LQQ. The 2 meter beacon is strong and is easily heard on a hand-held with rubber-duckie antenna. When a good 2 meter antenna is pointed at UO-9 signals can be as much as 40-45 dB above the noise providing for nearly perfect telemetry copy even at 1200 baud.

RS Telemetry Channels Clarified

AMSAT's Chief Area Coordinator for Europe, Pat Gowen, G3IOR, has helped answer some lingering questions regarding the meaning of certain of the RS telemetry channels. Pat had written about the telemetry in *Orbit* magazine #2 (June/July 1980, pages 17-19) and provided the data for *ASR* #23/24, 31 Dec. 81. Recently Finland's resident amateur satellite expert, Mr. Birger Lindholm had written *ASR* speculating on the possible meaning of telemetry channels previously unexplained in G3IOR's article or about which there was some residual doubt.

Again Birger, it seems, through some excellent analysis and deductive logic has correctly ascertained the meaning of the mystery third channel (prefixes N or R). Confirmation of Birger's correct analysis comes via a circuitous route from the RS builder (Alexander Papkov, see *ASR* #32) to UA3CR to LZ1AB to G3IOR. Pat provides the following:

Additions/changes to G3IOR articles in *ASR* and *Orbit*

First Channel (No prefix)
0 = Loaded current (?) — Equations as previously given
G = Service parameter — Equations as previously given
S = Stabilizer block temperature — Equations as previously given

Second Channel (Prefix I or S)
U = Relative 'S' units — Equations as previously given
S = Robot rcvr AGC — Equations as previously given
W = Service channel (command link) AGC — Equations as previously given

Third Channel (Prefix N or R)
K = Transponder output power — $0.2 \times N^2$ = output power in milliwatts
D = Solar panel current — 50 x N = current in milliamps
0 = Temperature of 1st solar panel — 2.7 (N-26) = temperature in degrees Celsius
G = Temperature of 2nd solar panel — (same)
U = Temperature of 3rd solar panel — (same)
S = Temperature of structure — 0.8 (N-5) = temperature in degrees Celsius
W = Temperature of hermetically sealed casing — (same)

Fourth Channel (Prefix A or U)
(No change from previous)

Fifth Channel (Prefix M or W)
U = Service channel power — 20 x N = power in milliwatts

Additionally, more information about the prefix changes is provided by G3IOR. Pat adds that if the first channel has an 'E' prefix, that means the service channel is active, i.e., that the satellite is under command. Similarly, if the second channel prefix changes from its normal I to S, that also indicates command channel activity. The same holds for the balance of the five channels such that the addition of a single dot to the prefix denotes command activity. Thus N becomes R, A becomes U and M becomes W. Previously this had thought to denote transponder activity but, when changes in the prefix did not correlate to transponder status changes, it remained unknown what the real meaning of the extra prefix dit was. We now know that an active transponder is indicated by a positive value for line K in each of the five channels.

Thanks to G3IOR, LZ1AB, UA3CR and Mr. Papkov for this new information. And a special note of congratulations to Birger Lindholm who, although not a licensed amateur, continues to exhibit the insights of perhaps the finest SWL known to *ASR*!

British Institute Publishes UoSAT Papers

The Radio and Electronic Engineer is the Journal of the Institution of Electronic and Radio Engineers (England). It has devoted its entire August/September 1982 issue (Volume 52 Number 8/9) to "UoSAT—The University of Surrey's Satellite (an investigation into cost-effective spacecraft engineering)."

AMSAT will make available to its members copies of this journal essentially at cost for $15, postpaid. The following is a list of the papers included with authors and a brief description of the paper.

UoSAT—An Investigation Into Cost-Effective Spacecraft Engineering, M.N. Sweeting

The Project manager for UoSAT outlines the background and its objectives and the experiments to be carried. The design and fabrication is described in relation to the overall philosophy and the test and procurement procedures are also dealt with. The paper gives details of the project management and its resources and finally summarizes the current status of the spacecraft and its experiments.

Attitude Control and Dynamics of UoSAT Angular Motion, M.S. Hodgart

The control of satellite attitude is achieved by magnetometer and by taking advantage of the gravity gradient caused by the differential between a mass at the end of a boom and the main body of the spacecraft.

The Primary UoSAT Spacecraft Computer, T.G. Jeans and C.P. Traynar

The RCA CDP1802 microprocessor has a 16K byte error correcting memory and interfaces to all the experiment package including the c.c.d. camera system and

can take complete operational control of the spacecraft.

A Low-Power 16-Bit Computer For Space Application, C.L.F. Haynes

The secondary spacecraft computer is a Ferranti F-100L microprocessor intended as a 'high-risk' system for assessing technologies which have not been proved in space. It has interfaces with all the experiments and has been used to handle telemetry.

The Development of a Satellite-Borne Earth Imaging System, C.P. Traynar and T.G. Jeans

The imager employs a two-dimensional c.c.d. array and design emphasis has been on low power consumption, weight and size, and on data transmission for reception and display by the simplest equipment.

The UoSAT V.H.F. and U.H.F. Data Beacons and Antenna System, R.W. Haining and A.K. Brown

The phase-modulated v.h.f. and u.h.f. transmissions are generated by doubling or tripling and doubling. The antenna is a canted turnstile fed from a coaxial cable hybrid and diplexer.

The UoSAT H.F. Beacons Experiment, C.R. Smithers and M.J. Underhill

Four phase-related beacons on 7, 14, 21 and 29 MHz enable trans-ionospheric experiments at the four frequencies to be carried out.

The UoSAT Microwave Beacons, A.K. Brown

The two beacons are on 2.4 and 10.4 GHz and respectively use a multiplied crystal with a 3-turn helix antenna, and a GaAs FET oscillator with a coaxial slotted dipole analogue.

The UoSAT Telemetry System, L.S.A. Mansi and R.A. Clarke

The telemetry system encodes the outputs of sensors used for the experiments and also for satellite engineering purposes. There are 60 sensor allocations and 45 channels for monitoring or controlling engineering functions.

Power Supplies, Conditioning and Distribution On UoSAT, J.Z. Slowikowski and M.J. Blewett

Power is supplied by nickel-cadmium cells kept charged by solar cell arrays. The monitoring arrangements for protecting the power supply are discussed.

The UoSAT Magnetometer Experiment, M.H. Acuna

A highly-sensitive 3-axis magnetometer of the fluxgate type is used to measure the Earth's magnetic field.

The UoSAT Radiation Monitor Experiment, I.C. Ferebee and D.R. Lepine

Two Geiger-Muller tubes with energy thresholds of 20 and 40 keV are carried and have been used to monitor electron densities during both geomagnetically quiet and disturbed conditions.

The entire document comprises just under 100 pages. If you wish to order, please send your $15 check to AMSAT, P.O. Box 27, Washington, DC 20044. Allow at least 6 weeks for delivery.

Keplerian Elements

	RS-3	RS-4	RS-5	RS-6	RS-7	RS-8
Element Set #	39	59	49	35	67	152
Ref. Epoch	82 300.51656378	82 307.48026738	82 300.85410379	82 311.42916553	82 311.83014173	82 312.05145607
1st Der. Mean Mot.	0.00000024	0.00000124	0.00000140	0.00000019	0.00000042	0.00000201
Inclination	82.9553	82.9543	82.9549	82.9543	82.9542	82.9532
RAAN	105.0414	104.2760	108.3881	99.6953	101.1251	102.9631
Eccentricity	0.0058327	0.0017262	0.0009639	0.0050023	0.0021847	0.0018553
Arg. of Perigee	160.4486	208.1526	259.7202	151.2027	161.9370	272.7990
Mean Anomaly	199.8820	151.8612	100.2770	209.1817	198.2471	87.0936
Mean Motion	12.15573955	12.06656730	12.05042112	12.13549602	12.08669376	12.02927268
Rev. # of Ref. Epoch	3816	3872	3787	3942	3931	3915

	AO-8	UO-9
Element Set #	706	331
Ref. Epoch	82 312.53547913	82 312.38283125
1st Der. Mean Mot.	0.00000149	0.00014255
Inclination	98.7711	97.5127
RAAN	330.7335	273.6608
Eccentricity	0.0006325	0.0004809
Arg. of Perigee	210.8150	33.6270
Mean Anomaly	149.2529	326.5044
Mean Motion	13.96506691	15.18609107
Rev. # of Ref. Epoch	23844	6024

Satellite	Ref Orbit Time	Long.	Period (Min.)	Increment (Deg.)	Set*
AO-8	01:27:57	99	103.170670	25.795035	704
UO-9	00:19:22	138	94.863214	23.715223	**
RS-3	00:15:06	326	118.519550	29.756641	39
RS-4	01:52:16	347	119.394495	29.975534	59
RS-5	00:41:40	329	119.554041	30.015445	49
RS-6	01:47:50	349	118.717184	29.806078	34
RS-7	00:26:05	326	119.195802	29.925827	66
RS-8	00:48:37	330	119.764228	30.068048	150

*NASA element set from which period and reference orbit is computed.
**UO-9 data calculated from NASA element set 327. Period and increment valid for 17 Nov. 82. Period changes −0.0021 min/day; increment changes −0.000535 deg/day as of 10 Nov. 82.

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